The association of firms' digitization determinants and financial performance

Master thesis

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Abstract

Over the last decades, digital transformation has been the most discussed trend in the business world, questioning how it can be utilized to increase performance. This research paper investigates the association between digitization and financial performance, dividing digitization in four themes, namely, it's adoption speed, adoption scope, the degree of a successful digital strategy and firm's digital orientation in general. A partial least squares structural equation modelling (PLS-SEM) approach is used, investigating German companies listed in the mDax. Despite not getting statistically significant results, the study finds counter-intuitive tendencies of digitization possibly being harmful for German companies, dependent on the digital channels used. This leads to various implications for practitioners and avenues for future research.

Table of Contents

Abbreviations

Abbreviation	Meaning
B2B	Business-to-business
B2C	Business-to-customer
CDO	Corporate digital officer
CRM	Customer relationship management
EBIT	Earnings before interest and taxes
e-WOM	Electronic word of mouth
FB	Facebook
IN	Instagram
MV	Missing values
n.d.	Not dated
OLS	Ordinary least squares
P&G	Procter and Gamble
PLS	Partial least squares
SEM	Structural equation modelling
SMEs	Small and medium enterprises
T	Twitter
VIF	Variance inflation factor
YT	YouTube

Figures

Tables

1. Introduction

Digitization is a widely discussed topic in media, extensively researched in academics and highly investigated by businesses. Universities teach that companies need to consider trends to stay competitive and firms who have failed to go digital missed out on many opportunities or even went bankrupt (e.g. Weltbild, Kodak). In contrast, many innovative, digital business models have become successful in recent years, attracting millennials for future careers (e.g. Airbnb, Netflix or Spotify). Especially start-ups are utilizing the opportunities of digitization, for example knowledge increase through information gathering and feedback, reaching a global customer base, user-friendliness and the easier promotion of internal and external responsibilities Tiago and Veríssimo (2014). Unquestionably, digitization is the largest trend of the past decade, creating numerous opportunities, but also challenges for businesses today.

In Germany there is still a lack of clarity about the value and methods of building a digital presence. In fact, 67% of German companies acknowledge rising opportunities through digitization for their business model, but only 44% have reported an increase in revenues due to digital tools in 2016 (Doll, 2017). In contrast, internationally, P&G and Ferrero have decreased their digital marketing budget by 100 million dollars in 2017, without experiencing consequences in form of decreasing revenues (Bialek, 2017; Pfannenmüller, 2017). They claim that digital marketing is not resulting in the promised benefits, shifting their focus back to traditional marketing channels, like TV advertisement and newspapers. Does this indicate that possibilities of digitization and their effects have been overestimated?

When looking at digital tools, especially social media networks have become important for marketing and communication with customers and employees in the last decades. According to the Global Web Index (n. d.), the daily social media usage has been continuously increasing over the last years, counting on average 118 minutes a day of a typical internet user, with

Facebook and Twitter being the most popular networks. Therefore, it is not surprising that companies are exploring business opportunities in these digital channels.

In fact, Facebook and Twitter are also the most popular networks investigated by researchers (Alalwan, Rana, Dwivedi, & Algharabat, 2017). Most studies investigating social media in a business context only focus on one or two channels instead of a multi-channel approach (Mozas-Moral, Bernal-Jurado, Medina-Viruel, & Fernández-Uclés, 2016; Paniagua & Sapena, 2014; Swani, Brown, & Milne, 2014). However, there are many other networks to investigate, e.g. Instagram, Pinterest, Snapchat or WhatsApp, which have hardly been researched so far. Additionally, many studies focus on digitization and social media performance in a particular industry or only in the context of the U.S. (Luo, Zhang, & Duan, 2013; Mozas-Moral et al., 2016). Lastly, they are focussing on social media, but not taking a more holistic view of its role in digitization. Therefore, a research gap occurs addressing cross-industry data as well as combining multi-channel and digitization data and comparing companies with different business models.

This study aims to address this gap, investigating the influence of several determinants of digitization on a firm's financial performance. More precisely, it evaluates four research questions:

- Does the speed of digitization adoption influence financial performance?
- Does the scope of digitization influence financial performance?
- Does the success of the digital strategy influence financial performance?
- Do companies with a higher digital orientation in general have superior financial performance?

Therefore, this study addresses digitization in a holistic view, including firms' digital orientation in general as well as social media measures as a major part of the digitization process.

To pay attention to a missing cross-industry approach, these research questions are addressed by investigating 50 German businesses, including business-to-business (B2B) and business-to-customer (B2C) companies from various industries, all listed in the mDax index. Furthermore, a wide range of different platforms are considered, namely Facebook (FB), Twitter (T), YouTube (YT), Instagram (IN), Pinterest, WhatsApp and Snapchat, providing one of the first multi-channel approaches addressing these research questions. Unlike many other studies, this study does not only take firms adoption of the different channels into account, but also the quality and success of firms' platform usage. It is the first to combine social media measures with a rating of digital orientation of firms in general. In contrast to many studies using surveys, this research uses a mixed-methods-approach, building on the investigated literature review, a qualitative digital orientation rating and publicly available data to conduct a quantitative analysis.

The results of this thesis can give valuable implications on the importance of the speed and scope of digital adoption. Additionally, it may indicate under which circumstances a multi-channel social media approach can increase financial performance, so that managers can adapt their digital strategies. Adding to previous studies, the thesis can give reasons for using more than just Facebook and Twitter, and becoming more digitally oriented. Lastly it can shed light into the value of digitization and whether it is overestimated as claimed by P&G and Ferrero.

In the remainder of this paper, a broad literature review and theoretical background is given on the current research in the field and existing research gaps. For a full understanding of the underlying parameters in this study, a methodology section explains data collection and analysis in detail, followed by an extensive explanation of its results. Lastly, implications for theory and managers are given as well as limitations of the study and recommendations for further research. The final remarks of this study will draw conclusions concerning the mentioned research questions.

2. Theoretical background

2.1. Literature review

Digitization and social media have gained more attention by researchers recently. An overview of relevant literature, summarizing main findings, investigated channels and limitations can be seen in Table 1. In general, the literature can be categorized into different literature streams, namely digital and social media research and more specifically social media in a marketing context, it's adoption, and link to financial performance.

Table 1: Literature overview

Authors	Study context and methodology	Social media channels investigated	Main findings	Limitations and future research directions
Culnan, McHugh, and Zubillaga (2010)	U.S. Fortune 500 firms **Methodology:** quantitative research and case studies	Facebook Twitter blogs discussion forums	- guidelines for successfully using social media platforms to create value - adoption of a channel alone is not sufficient - importance of 3 elements of implementation strategy: mindful adoption, community building, absorptive capacity	**Limitations:** none listed, however only investigated large U.S. companies and only 4 social media channels
Du and Jiang (2015)	S&P 1500 U.S. firms **Methodology:** OLS regression	Facebook Twitter YouTube LinkedIn RSS Blogs discussion forums	- a presence on Facebook and/or Twitter is positively related with firm performance - the influence of a social media presence on performance differs by platform - a higher breadth of social media presence does not automatically result in higher performance - an increase in breadth and depth of social media engagement is associated with higher performance	**Limitations:** not including Instagram U.S. firms only data from only 1 year **Call for future research:** finding feasible measures of social media strategies and activities
Hanna, Rohm and Crittenden (2011)	Grammy awards **Methodology:** best practice case study	Social media in general	- Social media transformed internet to a platform of influence instead of information - Firm's need to consider traditional and social media in an integrated ecosystem, with a common objective: launch new product/service; communicate new initiative; engage with customers	**Limitations:** lessons learned for one case study, not generalizable
He, Wang, Chen and Zha (2017)	Social media adoption of 27 SME U.S. businesses **Methodology:** case study: interviews	Facebook Twitter YouTube	-Adoption factors identified: perception of social media, personal characteristics, social influence (peer pressure), current business performance, business purposes. -Factors taken into consideration when deciding about continuing social media usage: resources for social media management, return on social media investment, achieving business purposes, turning fans into real customers	**Limitations:** interviews only conducted in the U.S. in only one city limited to SMEs **Call for future research:** include other social media channels and other countries
Ho, Damien, Gu and Konana (2017)	Sentiment analysis, U.S. firms **Methodology:** Bayesian dynamic linear model; regressions	Yahoo! Finance	- time-varying relationship between social media sentiments and stock returns	**Limitations:** only Yahoo finance, only U.S.
Järvinen, Tollinen, Karjaluoto and Jayawardhena (2012)	145 B2B companies from various industries but all from Finland **Methodology:** survey	Digital and social media in general	- digital measurement tools remain largely unexploited - social media tools are perceived as more important by larger firms - most important objectives: creating awareness, enhancing brand image - most B2B companies do not measure digital marketing performance -benefits of digital marketing of B2B firms are limited -barriers: lack of expertise and resources	**Limitations:** small sample (145), Finland only, only B2B **Call for future research:** international comparison longitudinal studies investigating attitudes to technology in relation to adoption

Authors	Study context and methodology	Social media channels investigated	Main findings	Limitations and future research directions
Luo, Zhang and Duan (2013)	Predictive relationship of social media on firm equity value **Methodology:** VARX model: time-series technique longitudinal	Blogs corporate websites consumer ratings google search	- existence of a predictive relationship between social media metrics, online consumer ratings and blogs with firm equity value - social media metrics have a faster and stronger predictive relationship with firm equity value than conventional online behavioural metrics	**Limitations:** causal relationships cannot be proven for predictive relationship only PC and software industries in the U.S. not always trustworthy data **Call for further research:** replication in other industries, application of text mining for more trustworthy data usage of field experiments for causal relationship proof
Michaelidou, Siamagka and Christodoulides (2011)	1000 UK B2B SMEs **Methodology:** survey	Facebook Twitter LinkedIn Myspace "Other"	-Usage: Facebook most widely used those who used social media, mostly used more than one channel low to no financial investments - Reasons: attraction of new customers, cultivation of relationships, increasing awareness, online communication of the brand, feedback, supplier interaction -Barriers: irrelevance of social networking sites within the industry, uncertainty as to the use of social networks to support brands, staff familiarity and lack of training - Measurements: users joining groups, number positive and negative comments, friend requests, new attracted customers	**Limitations:** not including all social media platforms only UK and only SME's **Call for future research:** replication with large B2B companies impact of industry on adoption rates relationship between adoption time and reasons for adoption
Mozas-Moral, Bernal-Jurado, Medina-Viruel and Fernández-Uclés (2016)	Twitter in olive oil industry in Spain **Methodology:** fsQCA	Twitter	- more activity on twitter of a firm favours more followers - more experience on twitter results in more followers - firm age is not an important factor on number of followers - the number of followers depends on the educational level - neither high activity, experience, nor a high managerial educational level ensures higher Twitter followers on their own	**Limitations:** only one industry: olive oil only in Spain only Twitter **Call or future research:** evolution of social media
Ngai, Moon, Lam, Chin and Tao (2015)	Literature review and guide to develop an social media application **Methodology:** case study	Social media in general	- development of a social media application framework - importance of understanding and adopting social media - insights on the proof of effectiveness of social media applications	**Limitations:** frameworks usability proved with only one case, further quantitative proof necessary literature review is not exhaustive **Call for future research:** defining guidelines for managers to apply relevant theories defining key performance indicators
Paniagua and Sapena (2014)	Twitter follower better for business performance than Facebook like **Methodology:** fixed effects, regression	Facebook Twitter	-effect of followers on social media on stock prices of publicly traded companies - social media followers have a positive effect on share prices once a critical mass is attained - follower on twitter is more impactful than a like on Facebook	**Limitations:** U.S. companies only only Facebook and Twitter investigated **Call for future research:** link between social corporate networking and operational performance social marketing affecting sales
Schniederjans, Cao and Schniederjans (2013)	Social media usage in impression management, pharma industry **Methodology:** automated text classification, support vector machine	Blogs discussion forums corporate websites	- social media in impression management positively influences financial performance, except for the strategy of exemplification - social media therefore can influence financial performance, depending on the purpose of its usage	**Limitations:** only pharmaceutical industry only addressing 5 dimensions of Impression management and no other contexts small sample size with 150 firms **Call for future research:** Including other impression management strategies larger sample size

Authors	Study context and methodology	Social media channels investigated	Main findings	Limitations and future research directions
Siamagka, Christodoulides, Michaelidou and Valvi (2015)	B2B in the UK **Methodology:** survey, case study	Social media in general	- firm's perceived usefulness of a social media channel and organizational innovativeness have a positive influence on B2B social media adoption -there is no significant relationship between perceived ease of use and B2B social media adoption - perceived ease of use and image positively influence perceived usefulness of social media - no significant relationship between results demonstrability and perceived usefulness - perceived barriers negatively impact B2B perceived usefulness of social media	**Limitations:** only UK and B2B small sample deductive approach **Call for further research**: inductive approach including different firm sizes
Taken Smith, Blazovich, and Murphy Smith (2015)	Fortune 500 adoption of social media **Methodology:** ANOVA	Facebook Twitter YouTube LinkedIn Instagram Google + Foursquare Pinterest Tumblr Blogs	- used social media platforms by U.S. corporations: Twitter, Facebook, YouTube, LinkedIn, Blog, Google+, Pinterest, FourSquare, Instagram, Tumblr - social media adoption is influenced by firm size - the mean adoption of social media does not depend on industry, but which type of channels are used is influenced by industry - social media adoption is not influenced by growth opportunity of a firm - no relationship between social media adoption and financial performance	**Limitations:** large U.S. firms only short-term effects only (limited to one year) quality of social media sites are not addressed **Call for future research:** address quality of social media sites (e.g. frequency of updates, followers, type of content) longitudinal study
Tiago and Veríssimo (2014)	Manager interview in Portugal, why firms are using digital media and what the perceived benefits are **Methodology:** survey	Digital in general	- perceived benefits of digital media, - categorization of digital engagement: competitive pressure, information gathering and feedback, digital media investments - definition of possible measures for digital marketing effectiveness	**Limitations:** limited to Portugal
Wang and Kim (2017)	Compustat North America and Global fundamentals annual databases **Methodology:** panel regression	Facebook	- importance of social CRM capabilities building customer engagement and contributing to business performance - social media usage mediates the relationship between CRM capabilities and business performance	**Limitations:** only investigating Facebook, therefore lack of generalizability, only large publicly traded corporations **Call for future research:** multi-channel research, smaller, private companies, multiple other measures of social media usage
Yu, Duan, and Cao (2013)	824 publicly traded U.S. firms in 6 industries **Methodology:** sentiment analysis	Twitter blogs discussion forums conventional media	- social media sentiment has a stronger impact on firm stock performance than conventional media - strong interaction effect of social and conventional media on stock performance	**Limitations:** Not business domain specific in sentiment analysis **Call for future research:** concentrating on financial business domain sentiment analysis in general public in comparison

Note: This table provides an overview of existing relevant literature of the topic of digitalization and social media. It shortly summarizes the context and methodology as well as main findings and mentioned limitations of the studies and their calls for future research. It does not display an exhaustive literature review, but only includes studies addressing relevant topics concerning the underlying research.

Digitization. The digital transformation has its origins even prior to the 1950s and since then revolutionized the behaviour of individuals and how they interact with organizations (Press, 2015). Within the era of Web 1.0, companies used the opportunity of digital resources to inform customers and create one-way communication, using the advantage of controlling that information (Kaplan & Haenlein, 2010). However, with the emergence of Web 2.0, companies were not in full control of the generated information anymore, but all users of the Internet could generate and constantly modify content (Kaplan & Haenlein, 2010; Mangold & Faulds, 2009).

Therefore, Web 2.0 enabled the evolution of social media channels, providing user generated content and enabling a two-way communication between companies and individuals (Kaplan & Haenlein, 2010). With the upcoming of social media, digital channels were no longer only a source of information, but a platform of influence that put a lot of companies under pressure to invent new ways to manage their digital presence (Hanna, Rohm, & Crittenden, 2011). Mangold and Faulds (2009) stress the importance of companies shaping customer discussions on digital platforms, in line with their organizations values.

Tiago and Veríssimo (2014) have identified several benefits of a digital presence as well as motivations of companies for digital engagement. In their study, marketing managers rated information gathering and feedback, user-friendliness, knowledge increase and the promotion of internal and external responsibilities as the most important benefits. However, next to utilising these benefits, most companies were driven to invest in digital due to external competitive pressures. Lastly the investment in a digital presence is relatively lower than investments in traditional media, making it more attractive. In fact most participants in their study name social networking sites as a priority area for investments (Tiago & Veríssimo, 2014).

To establish an effective digital presence, it needs to be anchored in the business strategy of the company (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). Bharadwaj et al. (2013) argue that in a digitally successful organization of the future, IT strategy must merge with business strategy, rather than being superior, resulting in a digital business strategy. They define digital business strategy as *"organizational strategy formulated and executed by leveraging digital resources to create differential value"* (Bharadwaj et al., 2013, p. 472), wherein the fundamental driver of value is IT. In their study, four themes of a digital business strategy are defined. Firstly, the scope of a digital business strategy, being the degree of digitization of all the activities, products and businesses owned and executed by the company. Secondly, the scale

of the digital business strategy, as the driver of profitability by scaling up a digital presence with the support of network effects, alliances and partnerships. Thirdly, the speed of a digital business strategy, including not only the rising speed of product launches nowadays, but also the speed of decision making and network formation as well as the speed of the supply chain orchestration within the company. Speed is seen as a valuable driver of competitive advantage, not only being the first mover but also being the fastest to scale up. Lastly, they identified sources of value creation and value capture in a digital business strategy, namely value from information and multisided revenue models, where a company might provide certain products and services for free to capture value in a different revenue stream. The study argues that value can be captured using coordinated business models in networks and by controlling the whole digital architecture of an industry, for example how Apple is able to charge a premium, just because of the perceived appeal to the end consumer (Bharadwaj et al., 2013).

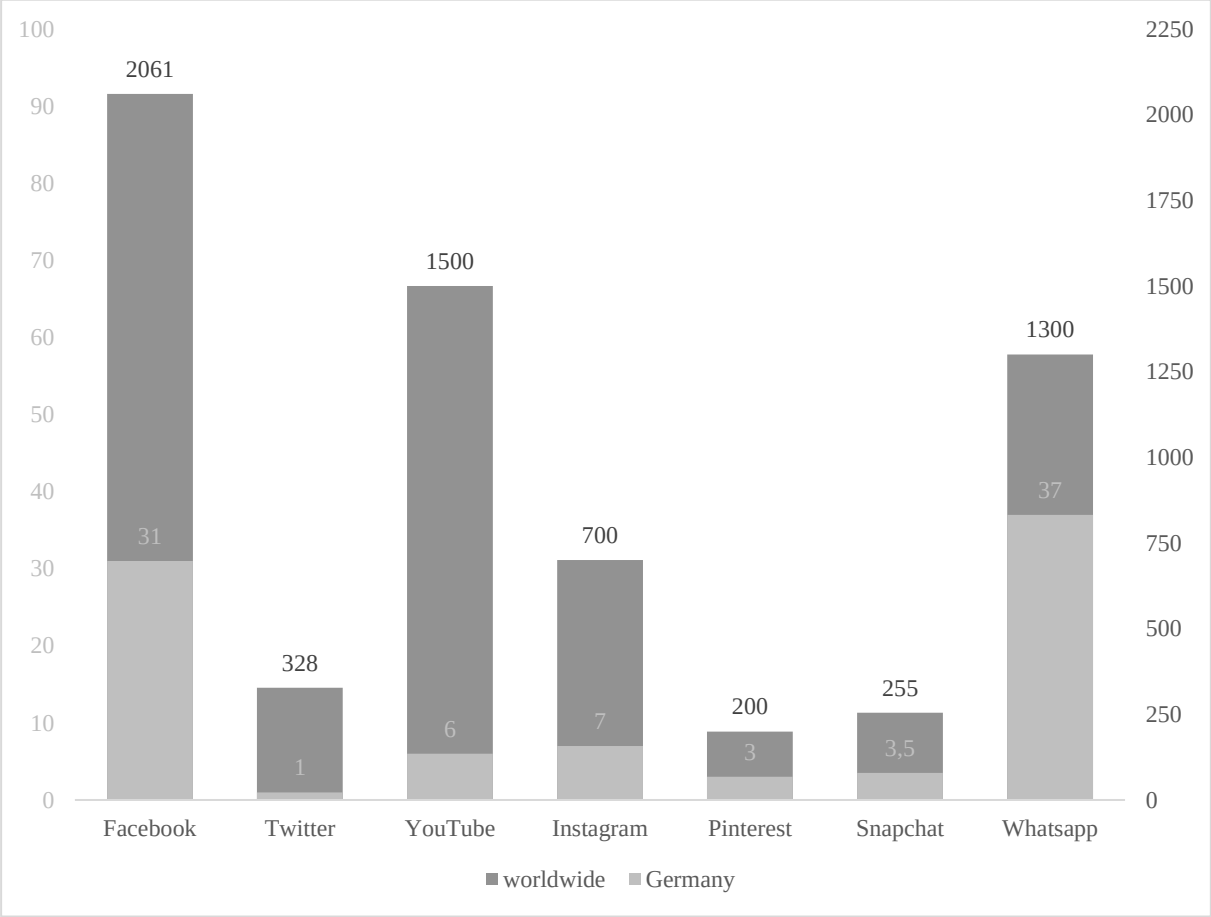
Social media. Making a clear differentiation between digital media and social media is difficult, since social elements of digital marketing have been discussed before social media was established (Järvinen, Tollinen, Karjaluoto, & Jayawardhena, 2012). Järvinen et al. (2012) consider social media as an integrated part of digital media, enabling interactivity. There are various definitions used within the current literature, most of them including attributes of shared content that is generated decentralised, as well as exchanged between users and between customers and organizations (Du & Jiang, 2015; He, Wang, Chen, & Zha, 2017; Kaplan & Haenlein, 2010; Mangold & Faulds, 2009; Schniederjans, Cao, & Schniederjans, 2013). One example is social media as *" a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of User Generated Content"* (Kaplan & Haenlein, 2010, p. 61). Today, there are countless social media platforms that can be divided into various categories, for example based on their level of interaction with media sharing sites such as Instagram and YouTube with the lowest level of interaction, followed by blogs and microblogs like Twitter and social bookmarking sites like

Pinterest. Virtual online communities already have a medium level of interaction which is even stronger in social networking sites like Facebook. The only form of social media that has a higher level of interaction are virtual worlds., where people live in simulated online worlds (Ngai, Moon, Lam, Chin, & Tao, 2015).

Facebook and Twitter are the networks investigated the most by researchers, however, mostly from a customer perspective (Alalwan et al., 2017). Worldwide, Facebook counts 2.061 billion active users, which resembles more than 25 times the population of Germany (Kepios, 2017). Within Germany alone, there are roughly 30 million Facebook users (Horizont, 2017). YouTube is the 2nd most popular network with 1.5 billion active users worldwide and 6 million in Germany (Kepios, 2017; Kontor4, 2017). Figure 1 shows active users worldwide and in Germany for several social media channels, proving a tremendous possibility for companies to reach millions of users. Additionally, these numbers are forecasted to increase steadily within the next years as seen in Appendix 1 (Statista, n.d.).

Shifting the perspective to companies, researchers have found different results in terms of social media adoption. For small businesses in the U.S. as well as the U.K, Facebook is the most dominant social network used (He et al., 2017; Michaelidou, Siamagka, & Christodoulides, 2011). Looking at big U.S. firms, 70% of Fortune 500 firms use Facebook and Twitter and 60% YouTube (Taken Smith et al., 2015).

Figure 1: Active social media users worldwide and in Germany in millions (2017)



Note: The figure shows active social media users in Germany and worldwide in the year 2017. The left axis corresponds to the users in Germany (in millions) and the right axis to users worldwide (in millions) (Kepios, 2017; Kontor4, 2017).

Looking at the existing social media literature, next to the adoption of social media, many researchers have investigated the purpose and perceived value of social media within certain areas. Social media is commonly used for product development, customer relationship management (CRM) including customer service, advertising, electronic word-of-mouth (e-WOM), branding and to learn about customer behaviour and perceptions (Alalwan et al., 2017; Culnan et al., 2010; Du & Jiang, 2015). Culnan et al. (2010) stress that value is created by the purpose of using a social media platform and not by the platform itself. Value is created through higher traffic and customer loyalty, higher revenues through increased sales using a "call for action" as well as cost savings through an improved and faster customer service (Culnan et al., 2010). Järvinen et al. (2012) identify the creation of awareness and brand image as the most important objectives of B2B companies, while other purposes are supplier interaction, getting

feedback from customers and the cultivation of relationships in general (Michaelidou et al., 2011). In contrast, many companies still have barriers of adopting social media, for example a lack of training and knowledge and resources, uncertainty about the usefulness of social media in the industry and in general (Järvinen et al., 2012; Michaelidou et al., 2011).

Link between digitization and financial performance. In several existing studies of the influence of social media on financial performance, there have been contradicting results. Some studies found that social media adoption is positively related with financial performance (Du & Jiang, 2015; Paniagua & Sapena, 2014; Schniederjans et al., 2013). However, most studies restricted their research only to Facebook, Twitter or both, not taking other types of social media, such as YouTube, Instagram or Pinterest into account (Ho, Damien, Gu, & Konana, 2017; Mozas-Moral et al., 2016; Paniagua & Sapena, 2014). Some find that an influence depends on the purpose of the shared content (Du & Jiang, 2015; Schniederjans et al., 2013) or differs by platform (Du & Jiang, 2015). The value of the activity within one channel is pointed out by Du and Jiang (2015), finding that only an increase in breadth and depth increases financial performance, however an increase in breadth alone is not sufficient.

In contrast, Taken Smith et al. (2015) did not find a meaningful relationship between social media adoption and financial performance. This might be due to the lack of including quality measures of social media, for example the activity on each channel, in their study, or not looking at a sufficient time frame, longer than one year (Taken Smith et al., 2015). In addition, Paniagua and Sapena (2014) state that social media marketing does influence financial performance, but not more than traditional media.

Assorted studies also investigate the value difference between digital channels and traditional media with different results. Paniagua and Sapena (2014) found that digital channels do not have a higher influence on performance than traditional ones (e.g. newspapers). Järvinen et al. (2012) discover that B2B companies find long established marketing tools more important than

social media tools. Some state that different media types need to be executed in an integrated ecosystem to ensure optimized success (Hanna et al., 2011).

In total, research on digitization and social media is still at an infant stage and many more areas need to be further investigated and proven. Especially the link to financial performance is not widely researched yet, calling for cross-industry, cross-country and multi-channel longitudinal studies.

2.2. Theoretical framework and hypotheses development

The current research builds upon two commonly used theoretical foundations: the resource-based view and the dynamic capabilities perspective. First, the resource-based view states that competitive advantages are anchored in valuable, rare, inimitable and non-substitutable resources of the firm (Barney, 1991). It proposes that an innovative climate within a company enables the adoption of new technologies and thereby increases the firms' capabilities (Siamagka, Christodoulides, Michaelidou, & Valvi, 2015). In line with that, the dynamic capabilities perspective argues that dynamic capabilities ensure that a firm can transform those resources, in order to adjust to fast changing market conditions (Wang & Kim, 2017). Dynamic capabilities are defined as *"the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments"* (Teece, Pisano, & Shuen, 1997, p. 516). Therefore, financial performance increases, when companies can adapt to changing markets quickly. Wang and Kim (2017) state that the integration of social media technologies forms a firms' specific marketing capability that can influence performance.

This study investigates the influence of digitization on financial performance. Figure 2 shows the conceptual model of the underlying study. As can be seen, the topic of digitization is divided into four themes: its speed, scope, success and the digital orientation of a company in general. The influence of each theme on financial performance is tested and the model controls for firm

size and firm age. Each of these themes will be defined more closely in the following paragraphs.

Speed of digitization. The dynamic capabilities perspective states the importance of a fast adaption to changing market conditions (Teece et al., 1997). Therefore, the underlying study firstly investigates the importance of the speed of digitization, using a first-mover advantage in addressing new target groups digitally. Bharadwaj et al. (2013) have defined speed of digitization with four components, the speed of new product launches, fast decision making within the firm, the speed of supply chain orchestration and the capability of rapid network formation and adaption. This research paper indirectly incorporates two of them within the speed of digitization, namely decision-making speed and network formation and adaption. Furthermore, in accordance with Järvinen et al. (2012) the underlying study considers social media as an integrated part of digital media, as an enabler of social interactivity and therefore a main component of a firm's digital presence. Consequently, in this research, speed of digitization is addressed through fast decision making of companies to "jump on the bandwagon" of the social media trend, starting to use different social media platforms, to form new networks and adapt to digital customer demands. Based on the resource-based view and the dynamic capabilities perspective of gaining a competitive advantage, it is proposed that speed of digitization is positively associated with firm performance.

Hypothesis 1: The speed of digitization is positively associated with superior financial performance.

Scope of digitization. Next to the speed of digitization, the breadth and depth of its usage needs to be addressed when investigating a company's digital presence. Bharadwaj et al. (2013) define scope as *"the portfolio of products and businesses as well as activities that are carried out within a company's direct control and ownership"* (p. 473). Based on the resource-based view, companies naturally try to extend their scope in order to widen their product and market reach

(Barney, 1991). This paper investigates the scope of digitization as mirrored in a firm's social media scope. When addressing the scope of social media, it is important to not only look at the number of different platforms a company is using, but also on the quality of the usage. According to Du and Jiang (2015), an increase in breadth and depth of social media engagement positively influences performance, while an increase in breadth alone does not. Therefore, scope in this study is defined as the breadth of social media platforms adopted by a firm in combination with its depth, namely the activity on each platform. In accordance with the findings of Du and Jiang (2015) it is proposed that the influence of digitization scope on financial performance is positive.

Hypothesis 2: The scope of digitization is positively associated with superior financial performance.

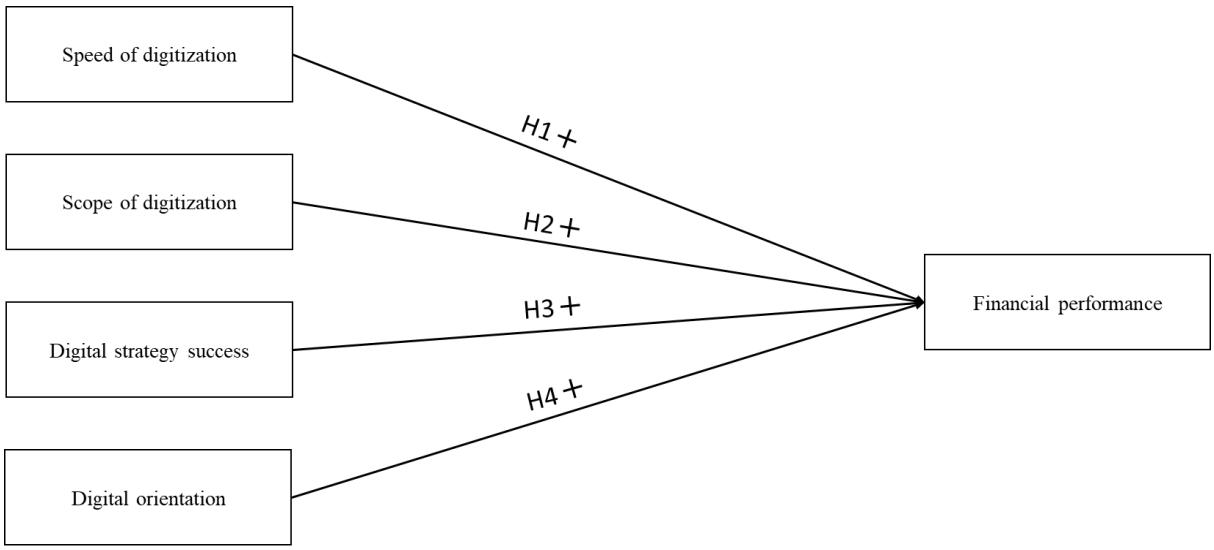
Success of digital strategy. Being the first company in adopting all digital platforms and filling them with content will not lead to superior financial performance if nobody notices. Culnan et al. (2010) state that adoption alone is not sufficient, but the right implementation strategy is crucial. A key necessity of capturing value from a digital presence, is the degree of success of the digital strategy behind it. In other words, how the content provided by companies is perceived by customers is a key factor in determining its value. From a dynamic capabilities perspective, it is important to monitor customers reactions on platforms and use this capability to quickly adjust the strategy to their needs, to ensure customer loyalty and retention. Therefore, it can be assumed that a higher success of the digital strategy will lead to greater customer engagement and loyalty. Consequently, it is proposed that the degree of digital strategy success positively influences a firm's financial performance.

Hypothesis 3: The degree of success of a digital strategy is positively associated with superior financial performance.

Digital orientation. Lastly, the overall digital orientation of the organization must be considered. This includes whether there is a digital strategy in place, with clear objectives and goals for the future, but also whether the company has a responsible employee for digital transformation. Additionally, in accordance with Bharadwaj et al. (2013), a digitally oriented company has digitized processes, a fast supply chain orchestration, the capability to capture value though network effects and increased information available due to digital channels. To be digitally oriented, a company does not necessarily excel in all areas, but needs to be aware of the opportunities of a digital presence and be in the transformation process if some practices are not yet adopted. The technology adoption model states that the perceived usefulness and ease of use of technology influence the attitude and usage attention of the technology, resulting in the adoption of it (Davis, 1989). Therefore, when addressing digital orientation, various aspects of adopted practices but also processes in transformation and consideration of companies are considered. In line with many researchers' findings, this study proposes a positive relationship between an organizations digital orientation and its financial performance.

Hypothesis 4: A higher digital orientation of a firm is positively associated with superior financial performance.

Figure 2: Conceptual model



Note: The figure displays the broad conceptual model of the underlying study and the described hypotheses. A more detailed explanation of how the constructs are measured follows in Figure 3.

3. Methodology

3.1. Data collection and sample description

To investigate how firms can orchestrate the influence of social media on consumers, a mixed-methods-approach is used. This paper examines annual reports and social media platforms of the 50 listed mDax companies in Germany. The mDax lists the *"50 largest companies from classic sectors in Prime Standard ranking directly below the DAX shares"* (Börse, 2017). Companies are weighted based on market capitalization and trading volume and technology sectors are excluded. Therefore, it is an index that mirrors the German middle-class. An overview of all companies listed in the mDax, their industry and size can be seen in Table 2. Using all companies listed in one index ensures a good comparability of different measures. For each firm, annual reports as well as publicly available social media data were collected at the platforms themselves and using sociograph.io as well as twitonomy.com. Social media data was taken from the following platforms: Facebook, Twitter, YouTube, Instagram, Pinterest, Snapchat and WhatsApp. Sociograph.io was used to collect data from Facebook up to the due day of September 3rd, 2017, including number of posts, likes and followers as well as creation

date and reactions, shares and comments per post on average. Twitonomy.com was used to collect Twitter data up to the due date of August 22nd, 2017, including number of Tweets, followers and others followed, creation date, retweets and Tweets retweeted as well as hashtags and Tweets per day. Twitter likes were collected from the respective Twitter pages themselves. Additionally, financial data was collected from boerse.de, to calculate excess returns. In the following section it is explained how this data measures the constructs of the conceptual model in Figure 2.

Table 2: Companies listed in the mDax

Company	Industry	Firm Size (number of employees)	EBIT (annual 2016)	Firm Age
Aareal Bank AG	Banking / Financial Services	2,728	366,000,000	94
Airbus Group SE	Aerospace, Defence	133,782	3,960,000,000	17
alstria office REIT-AG	Real Estate	114	244,488,000	11
Aurubis AG	Raw Materials (Copper production)	6,454	177,000,000	151
Axel Springer SE	Media, Publishing	15,323	471,100,000	71
Bilfinger SE	Industrial Services	39,946	230,800,000	137
Brenntag AG	Wholesale (Chemicals)	14,826	647,300,000	143
Covestro AG	Chemicals	15,761	1,331,000,000	2
CTS Evetim AG & Co. KGaA	Ticket Sale	2,384	162,000,000	18
Deutsche EuroShop AG	Real estate	5	178,600,000	20
Deutsche Pfandbriefbank AG	Banking / Financial Services	756	301,000,000	148
Deutsche Wohnen AG	Real estate	943	2,699,000,000	93
Dürr AG	Automotive Supplier	15,235	271,400,000	122
Evonik Industries AG	Specialty Chemicals	34,351	1,448,000,000	10
Fielmann AG	Retail	17,549	241,300,000	45
Fraport AG	Airport Operator	20,322	693,700,000	70
Fuchs Petrolub SE	Chemicals	4,898	371,000,000	86
GEA Group AG	Mechanical Engineering	16,937	387,000,000	136
Gerresheimer AG	Packaging Manufacturer	9,904	181,000,000	153
Hannover Rückversicherung AG	Insurance	2,893	1,689,348,000	26
HELLA KGaA Hueck & Co.	Automotive Supplier	33,689	420,000,000	118
Hochtief AG	Construction / Building	5,149	816,700,000	142
Hugo Boss AG	Luxury Fashion	13,798	263,500,000	93
Innogy	Energy	40,636	2,735,000,000	1
Jungheinrich AG	Mechanical engineering	15,010	235,000,000	64
K+S AG	Mining	14,446	229,300,000	128
Kion Group AG	Utility vehicles manufacturer	30,544	434,800,000	11
Krones AG	Machine manufacturer	14,443	228,000,000	66
Lanxess AG	Chemicals	16,721	464,000,000	13
LEG Immobilien AG	Real Estate	990	779,600,000	47
Leoni AG	Automotive	69,283	34,700,000	100

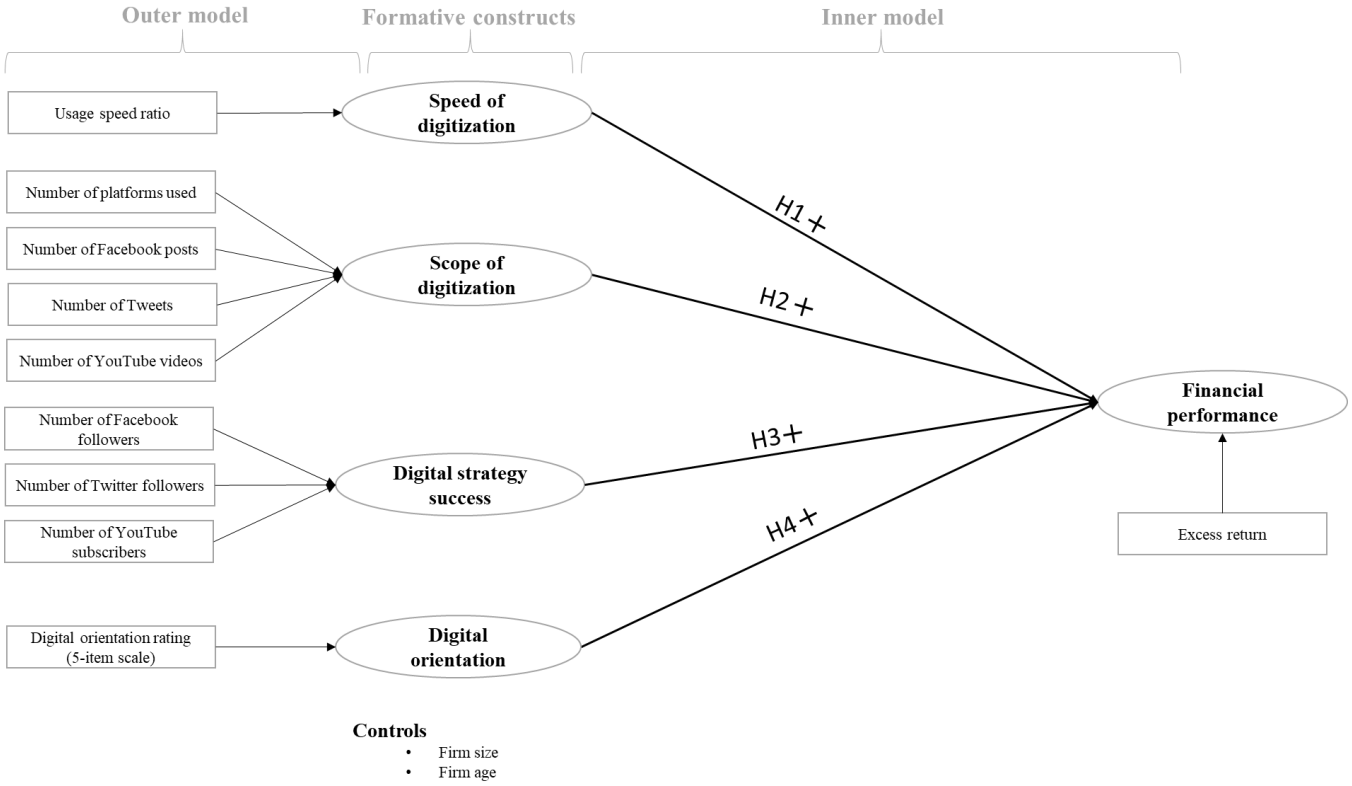
Company	Industry	Firm Size (number of employees)	EBIT (annual 2016)	Firm Age
Metro Group	Wholesale and retail	219,678	1,513,000,000	21
MTU Aero Engines AG	Aircraft engine manufacturer	8,368	452,800,000	83
Norma Group SE	joining techniques	6,664	120,001,000	68
OSRAM Licht AG	Lighting technology	34,200	718,000,000	111
Rational AG	Kitchen appliances	1,713	166,500,000	44
Rheinmetall AG	Automotive and Defence	20,993	353,000,000	128
RTL Group SA	Media	10,325	1,197,000,000	86
Salzgitter AG	Steel	25,168	119,000,000	19
Schaeffler AG	Mechanical engineering	86,662	1,566,000,000	71
STADA Arzneimittel AG	Pharmaceuticals	10,923	178,900,000	122
Steinhoff International Holdings N.V.	Furniture	105,866	1,793,000,000	54
Ströer Media SE	Advertising	4,577	92,800,000	27
Südzucker AG	Sugar	16,908	277,000,000	91
Symrise AG	Flavours and fragrances	8,944	423,300,000	14
TAG Immobilien AG	Real Estate	833	336,200,000	135
Talanx AG	Insurance	21,649	2,300,000,000	21
Uniper	Energy	12,635	-3,963	1
Wacker Chemie AG	Chemicals	17,205	366,200,000	103
Zalando SE	E-commerce	11,998	207,000,000	9

Note: This table shows all companies listed in the mDax in 2017, the industry they operate in as well as their number of employees and earnings before interest and taxes (EBIT) and firm's age as reported in the annual reports of the companies.

3.2. Measurement of the variables

The four themes of digitization are measured based on social media data and annual reports of the firms. In general, it must be said that many companies do not use certain social media platforms, with Instagram, Pinterest, Snapchat and WhatsApp being less used. Consequently, these channels had to excluded from hypothesis testing, due to too many missing values, however partly used for robustness checks. An additional model was investigated including Instagram, however, due to too many missing values the hypotheses tests were conducted in the model without Instagram measures, to increase statistical power. Additionally, *Uniper* and *Innogy* are listed in the mDax shorter than one year, therefore a calculation of excess return was not possible, and the two companies had to be excluded from hypotheses testing, resulting in a sample size of 48 companies. Figure 3 shows a more detailed overview of the variables and their measurements, each of them explained in the following. Additionally, Appendix 2 displays the data used for the analysis.

Figure 3: Detailed conceptual model in Smart PLS



Note: This figure shows the detailed model conducted in Smart PLS to determine the coefficients and test the hypothesis. It displays how the explained constructs are measured. The outer model is a factor analysis of the indicators of the formative constructs. Afterwards the inner model is determined by a partial least squares regression.

Speed of digitization. As stated by Bharadwaj et al. (2013), speed of digitization includes speed of decision making as well as the speed of a formation of networks. The creation date of a firm's social media page seems like a good indicator for both, quick decision making and a formation of a network. Therefore, speed is measured using the creation date of a firm's social media page in relation to the year of creation of this platform in general. This is also in line with Mozas-Moral et al. (2016), measuring firm's experience by the years networks have been used by the firm. For every measured channel the following formula is used:

$$\frac{years\ a\ firm's\ SM\ page\ exists}{years\ the\ SM\ platform\ exists}$$

A problem might occur distinguishing between firms who used to have a channel, but do not have it anymore being valued similarly to companies who just recently adopted the channel.

However, after controlling for former channels of firms not using platforms currently, it is assumed that none of the companies not using one of the platforms today have used it before.

Next, the average ratio is build, using all channels a firm has adopted, as follows:

$$\frac{sum\ of\ all\ speed\ ratios\ of\ the\ firm}{number\ of\ platforms\ a\ firm\ uses}$$

As an example, Facebook has been made available to the public in 2004 and *Zalando* started using it in 2009. Therefore, the speed ratio for its Facebook channel is calculated in the following way:

$$\frac{1 + 2017 - 2009}{1 + 2017 - 2004} = \frac{9}{14} = 0.6429$$

With *Zalando* also using Twitter and YouTube all respectively calculated ratios are added and divided by three. Therefore, only used channels are included in the calculation of adoption speed. That is, since the number of channels used are included in the scope measure of digitization as explained in the following.

Scope of digitization. Scope is measured with a construct of four measures, as seen in Figure 3. As mentioned before and in line with Bharadwaj et al. (2013) breadth and depth of social media are addressed. First, the number of channels a firm uses in general, as a measure of breath of social media usage. As already mentioned, in the tested model this only includes Facebook, Twitter and YouTube, due to higher statistical power. However as seen in section 4, robustness checks were conducted including Instagram. The remaining measures of the scope construct investigate the quality of the social media pages of the companies, by looking at the activity depth. This includes the total number of Facebook posts, Tweets and the total number of videos on the firm's YouTube pages.

Digital strategy success. Similarly to Paniagua and Sapena (2014) measuring customer preferences with Twitter followers and Facebook likes, digital strategy success is measured by a construct of three components: Facebook followers, Twitter followers and YouTube subscribers. This resembles the interest of consumers in the content of the companies' respective social media pages and as a result how successful firms are in reaching and engaging loyal customers. Again, the focus in the model is on the three mentioned platforms, however, robustness checks included more channels.

Digital orientation. A 5-item scale was developed for this purpose, as a qualitative indicator of the degree of firms' digital orientation. Firms were categorized in the respective categories described in Table 3. To ensure accuracy in the rankings, all companies were examined by the author as well as Veronica Schuh independently and later compared. If different ratings were given, the overall rating of that company was discussed again, and differences were reconciled. Criteria taken into consideration were the presence of a digital strategy with clear goals in terms of digitization, the presence of a chief digital officer (CDO) or a similar responsible for digitization in the firm, as well as the awareness of digital trends of the company and how they plan to address them in the future. To assess these criteria, annual reports as well as companies' websites were studied. Firms were categorized in the respective categories described in Table 3. For a better understanding of the categories, Table 3 shows an example and reasoning for a company put in each category.

Table 3: Digital orientation categorization

Category	Code	Criteria	Example
Traditional	1	No one is named as responsible for digitization. There is no or only little awareness of digital trends and challenges. The company does not have clear plans to address digital challenges and no clear targets for the future in this area. The company is not yet or only little digitized and there is no investment in digital innovation.	**Deutsche Wohnen AG:** - digital is not mentioned once in their annual report - there is no responsible named for digitization - neither in the annual report nor on the website it is written about digital trends and targets or any investments in that area
Slowly adapting to digital trends	2	The company is aware of digital trends and might even have a responsible for digitization. Slowly, plans are made to tackle challenges, but nothing has really been accomplished yet. There are no clear targets and goals in terms of digitization formulated and there is only a low degree of digitization in the company.	**TAG Immobilien AG :** - no responsible for digitization - addressing digital challenges and trends in their annual report - only few process are digitized so far, but e.g. keeping digital data on customers is still in its beginner stage with lots of data not being converted yet - there is no clear strategy and targets on the matter of digitization
Average	3	The company is aware of digital trends and might even have a responsible for digitization. It has already some plans and goals for addressing digital challenges and has an average degree of digitization within its industry.	**Hochtief AG:** - there is not a responsible for digitization - Hochtief is aware of digital trends and addresses them in their annual report -the company has ideas on tackling digital challenges and already offers some digital services, such as digital construction and a digital project execution tool - there is not a clear digital strategy and goals clarified in the annual report
Fastly adapting to digital trends	4	The company has a CDO or someone equivalent, only responsible for digitization. A lot of processes are digitized, and the company actively uses digital media to drive revenues. It has clear targets and goals for tackling digital trends and invests in some digital innovations. It is faster in adapting than average in its industry.	**Ströer Media SE:** - there is a CDO (chief digital officer) - digitization trends and challenges are widely addressed in the annual report and Ströer is a main driver in digitizing advertisements - there is a digital strategy and lots of processes are already digitized - however the clarification of clear digital targets and goals of Ströer as a company is missing in the annual report
Highly digitized company	5	The company is completely digitized. Digital is its main operating area, driving most of the sales. There is a clear digital strategy with clear targets and goals pursued and the company invests in digital innovation.	**Zalando SE:** - CDO present - digital trends and challenges addressed and orchestrated in the company's mission and strategy - clear digital strategy with targets - creation of a digital hub - nearly all processes are digitized, and the main revenues are generated digitally

Note: This table gives an overview how companies are categorized based on their digital orientation. It explains how certain degrees of digital orientation are coded and gives examples of companies in each category. The rating was developed for this study.

Financial performance. Since all companies in the sample are listed in the mDax index, they can be easily compared in terms of financial performance using excess return. Data of returns of the mDax in general and the respective firms between August 2015 and July 2017 was collected using boerse.de. An example of the calculation of excess return can be seen in Appendix 3. As mentioned earlier, *Uniper* and *Innogy* were formed only recently and consequently data of past returns are not available, making an accurate calculation of excess return impossible. Therefore, the two companies were excluded from the sample. *Schaeffler* and *Covestro*, which are listed in the mDax since later in 2015 were included and excess return was calculated with the available data. Additionally, it was controlled for outliers and as a result

the excess return value of *Covestro* was replaced by the value of the mean added by two times the standard deviation of the sample.

3.3. Analysis and hypothesis testing

The programme used for hypotheses testing is Smart PLS, in order to conduct partial least squares structural equation modelling (PLS-SEM). This method was chosen, because it allows a testing of small samples with heterogeneous data that is not normally distributed, as it is the case with the collected data. In addition, it enables the use of formative constructs almost unrestrictedly, that are necessary to measure scope and success in the underlying model (Hair, Sarstedt, Ringle, & Mena, 2012). There is however one rule of thumb that should be met when conducting a PLS-SEM, namely that the sample size is at least ten times the number of paths pointing at a construct in the outer and inner model (Barclay, Thompson, & Higgins, 1995). That rule limits the amount of data that can be used in the underlying model and is a main reason for not including more indicators in the formative constructs. For all PLS calculations the standard settings of a path weighting scheme with maximum 500 iterations and a stop criterion of 10^7 were chosen. For significance testing of coefficients, the bootstrapping resampling procedure is used with 5000 subsamples, providing t-statistics and p-values, checking for significant results on a 90% level.

Missing values. Smart PLS offers three possibilities to handle missing values: mean replacement, casewise deletion and pairwise deletion. In this study values are missing when a firm does not use one of the social media platforms. In a case of a firm not using Facebook for example, values for Facebook posts and followers would be missing. Ideally, this research only investigates speed, depth and success of Facebook adoption from those companies using the channel. Therefore, a mean replacement is not a desirable choice. However, with casewise deletion of missing values all companies that do not adopt one of the investigated channels would be deleted, resulting in an extremely small sample size. Finally, pairwise deletion is the

chosen option for this study. This method only deletes cases with missing values in each pair of variables, retaining as much information as possible (Barladi, 2010). Nevertheless, for resampling methods the sample size is too small for the calculation of t-statistics and p-values. Consequently, the tests were repeated using mean replacement as well as replacing the missing values with their true value of zero, in order to conduct bootstrapping and test for significance.

Robustness checks. As already mentioned above, two additional tests were done, using mean replacement and replacing missing values with zero, to enable significance testing. Furthermore, one model with Instagram included was conducted for a holistic picture, and each channel was tested on its own, disentangling the effect of different platforms. Finally, it was controlled for firm size and firm age as seen in the conceptual model in Figure 3.

4. Results

The main objective of this research was to analyse the influence on digitization on financial performance, using social media data as well as strategic data from the company's annual reports. Firstly, this section looks at general descriptive statistics of the underlying sample. Secondly, correlations between different variables are analysed and lastly, the described hypotheses are tested, and it is controlled for robustness.

Table 4: Descriptive statistics

	Mean	Standard deviation	N
Employees	25587.48	39375.11	48
Firm age	73.79	48.36	48
Excess return (outlier controlled)	0.00	0.16	48
EBIT	669507020.83	777711062.03	48
Digital strategy (yes-1 / no-0)	0.25	0.44	48
CDO / responsible for digitization (yes-1 / no-0)	0.50	0.51	48
Digital orientation	2.56	1.17	48
Twitter usage (yes-1 / no-0)	0.85	0.36	48
Twitter usage speed ratio	0.50	0.29	48
Twitter followers	32849.75	128693.33	40
Tweets	5398.45	14877.07	40
Facebook usage (yes-1 / no-0)	0.73	0.45	48

	Mean	Standard deviation	N
Facebook usage speed ratio	0.27	0.22	48
Facebook posts	1313.74	2215.55	35
Facebook followers	441290.83	1532532.05	35
YouTube usage (yes-1 / no-0)	0.90	0.31	48
YouTube usage speed ratio	0.41	0.22	48
YouTube number of videos	166.86	281.21	43
YouTube subscribers	8038.17	33594.89	41
Instagram usage (yes-1 / no-0)	0.46	0.50	48
Instagram usage speed ratio	0.20	0.30	41
Instagram followers	1605719.05	6635618.97	22
Instagram posts	574.91	972.74	22
Number of channels used (FB/T/YT/IN)	2.94	1.08	48
Speed ratio over channels used	0.45	0.18	48

Note: The table shows descriptive statistics of relevant variables for this study. Bivariate variables are coded 1 for yes and 0 for no. Digital strategy, CDO/responsible for digitization and digital orientation were determined by two individuals and later compared to resolve differences, to ensure a more objective evaluation. However, this was done using information from annual reports and company websites only. Abbreviations are explained in the beginning of this paper.

Descriptive statistics. An analysis of descriptive statistics and correlations was conducted using SPSS to get a first understanding of the variables and their relationships. An overview of the descriptive statistics and how bivariate variables were coded can be seen in Table 4. As seen, this study finds that only 25% of the 48 companies included in the sample have a clear digital strategy, implicating that many German companies do not capture value from digitization to its full potential. This interpretation needs to be addressed carefully, keeping in mind that this categorization was made only based on annual reports and independently by only two individuals, as addressed in section 5.3. In contrast, with half of the companies having a responsible person appointed for digital topics within the firm, and 46 out of 48 companies using at least one social media channel, it can be said that almost all companies are aware of digital opportunities. With 90% of the companies having an own YouTube channel, this is the most used social media channel, followed by 85% of the companies using Twitter and 73% having a Facebook page. Instagram on the other hand has not yet proven useful for most companies, with an adoption rate of only 46%. Taking only these four channels into consideration the average number of channels a company adopted is 2.94, indicating that most

companies already pursue a multi-channel approach. When looking at all channels investigated, additionally including Pinterest, company blogs, Snapchat and WhatsApp, the average number of channels adopted by the firms is 3.58. In general, when assessing this data, it needs to be taken into consideration, that the sample involves many different industries and different sized companies, as indicated by the high standard deviation in the number of employees, EBIT and firm age.

Correlations. As mentioned above, to get a closer idea of the relationships between variables correlations were calculated in SPSS as well and the correlations matrix is displayed in Table 5. Firstly, noticeable is that none of the variables show a significant correlation with the dependent variable, excess return. This may be due to many factors influencing this variable, including many indicators not included in this study, for example a company's reputation and forecasts. Additionally, Twitter and YouTube followers, as two of the indicators of digital strategy success, are positive correlated with EBIT, however Facebook and Instagram followers are not. This indicates that bigger firms might be more successful especially on YouTube with a moderate correlation, but also on Twitter with a weak positive correlation, while firm size is not an important topic considering digital strategy success on Facebook and Instagram. This underlines that different channels might have completely different purposes and effectiveness and therefore the underlying model must be addressed carefully, since different channels might have contradicting influences on the formative constructs used. However, a different origin for these differences might be that less companies use Facebook and Instagram, leading to a smaller sample size on those tests which might not be sufficient to see significant results on a 90% level.

Table 5: Correlations of the involved continuous variables

	Employees	Firm age	Excess return (outlier controlled)	EBIT	T usage speed ratio	T followers	Tweets	FB usage speed ratio	FB posts	FB followers	YT usage speed ratio	YT no. of videos	YT subscribers	IN usage speed ratio	IN followers	IN posts	Number of channels used (FB/T/YT/IN)
Firm age	-0.162																
Excess return (outlier controlled)	-0.055	0.039															
EBIT	,501**	-0.284	-0.034														
T usage speed ratio	-0.178	-0.179	0.110	-0.042													
T followers	0.223	-0.066	-0.172	,314*	0.174												
Tweets	-0.020	-0.096	0.018	0.013	0.201	0.085											
FB usage speed ratio	0.276	-0.180	0.030	-0.037	0.133	0.037	-0.026										
FB posts	-0.054	-,378*	-0.022	-0.018	0.032	-0.002	0.193	0.196									
FB followers	-0.013	-0.121	-0.105	0.011	0.192	,767**	0.075	0.030	,438**								
YT usage speed ratio	-0.022	-0.112	-0.053	-0.182	,363*	0.158	0.070	0.225	0.039	0.195							
YT no. of videos	0.068	-0.164	-0.074	0.072	,304*	0.144	0.286	0.249	0.197	0.102	0.300						
YT subscribers	,440**	-0.215	-0.003	,655**	0.218	,978**	0.083	0.173	0.199	,480**	0.097	,352*					
IN usage speed ratio	-0.038	-,314*	-0.224	-0.008	0.179	,443**	,350*	0.134	,416*	,467*	,319*	,493**	0.295				
IN followers	-0.145	-0.224	-0.101	-0.103	-,500*	,952**	-0.017	-0.034	0.267	-0.010	-0.401	-0.144	-0.038	-0.207			
IN posts	-0.205	-0.171	-0.131	-0.159	0.178	0.322	0.244	0.201	0.418	,562*	0.210	,628**	0.114	0.386	0.051		
Number of channels used (FB/T/YT/IN)	0.115	-0.128	0.090	-0.034	,478**	0.232	0.230	,510**	0.220	0.245	,490**	,365*	0.207	,570**	-0.315	0.175	
Speed ratio over channels used	-0.072	-,422**	-0.151	-0.024	,549**	0.184	0.111	0.218	0.193	0.297	,562**	,336*	0.202	,339*	-0.321	,457*	0.187

Note: This table shows the correlation matrix of the involved continuous variables in this study. Note that there are different sample sizes occasionally, due to missing values of companies not using certain channels. Abbreviations are explained in the beginning of this paper. ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

Inner model and hypothesis testing. The inner model as seen in Figure 3 was conducted by a partial least squares regression in Smart PLS. As already mentioned it was calculated, using pairwise deletion of missing values. However, since bootstrapping could not deliver p-values due to a too small sample size, additional tests of the same model with different treatments of missing values and various robustness checks were conducted. Results of all models are displayed in Table 6. As seen, the chosen pairwise deletion model explains 13.8% of the variance in excess return. At first, this seems to be a weak result, however excess return is a complex variable dependent on many factors of which some indicators are not included in the model. When assessing financial performance R^2 values are usually low. Therefore 13,8% is a moderate result considering that digitization is the only considered indicator. Comparing this score with models with other missing value replacement methods, results are almost completely identical for R^2. However, the lower and in the single channel models even negative adjusted R^2 indicates that too many independent variables might be included, resulting in a poor model fit for the underlying data. This will be further discussed in section 5.3.

Testing hypothesis 1. Hypothesis 1 proposes a positive influence of speed of digitization on financial performance. Even though there is a positive coefficient of speed of digitization, it is not statistically significant, failing to support hypothesis 1 ($p= 0.472$). Based on this, it cannot be proven that a faster adoption of digital channels leads to higher financial performance. Nevertheless, considering the small sample size in this research, there is a slight tendency to support the hypothesis at least partially. When looking at the separate channels on their own, the negative and positive coefficients indicate that the lack of a significant result might be due to different channels having a tendency of contradicting influences. These results are also supported by the discussed correlations, with Twitter and Facebook having positive but insignificant correlations with excess return and YouTube and Instagram negative and insignificant correlations.

Table 6: Inner model results

	Main models		Robustness checks							
	MV: pairwise deletion	MV: 0	MV: 0, with controls	MV: mean replacement	With IN, pairwise deletion	With IN, mean replacement	FB only, pairwise deletion	YT only, pairwise deletion	T only, pairwise deletion	IN only, pairwise deletion
coefficients										
Digital orientation	-0.217	-0.187	-0.183	-0.182	-0.113	-0.077	-0.075	-0.072	-0.084	-0.043
Success	-0.120	-0.205	-0.203	-0.237	-0.06	-0.173	-0.109	0.063	-0.177	-0.106
Scope	0.292	0.270	0.280	0.275	-0.045	-0.061	0.043	-0.086	0.019	-0.031
Speed	0.121	0.164	0.154	0.120	-0.262	-0.205	0.054	-0.016	0.155	-0.197
Firm age			-0.049							
Firm size (employees)			-0.054							
Model fit										
R^2	0.138	0.137	0.141	0.137	0.102	0.103	0.016	0.013	0.050	0.045
R^2 adjusted	0.058	0.057	0.016	0.057	0.019	0.019	-0.076	-0.079	-0.038	-0.044
P-values bootstrapping										
Digital orientation	n/a	0.147	0.197	0.186	n/a	0.554	0.645	0.670	0.594	0.765
Success	n/a	0.362	0.406	0.248	n/a	0.337	0.813	0.762	0.587	0.589
Scope	n/a	0.399	0.390	0.396	n/a	0.788	0.915	0.756	0.945	0.901
Speed	n/a	0.472	0.502	0.616	n/a	0.480	0.757	0.918	0.237	0.145
Firm age			0.778							
Firm size (employees)			0.691							

Note: This table shows the results of the inner models of the different tested models and bootstrapping results for significance testing. All results are taken from the different Smart-PLS analyses conducted. MV stands for missing values. All abbreviations are explained in the beginning of this paper.

Testing hypothesis 1. Hypothesis 1 proposes a positive influence of speed of digitization on financial performance. Even though there is a positive coefficient of speed of digitization, it is not statistically significant, failing to support hypothesis 1 (p= 0.472). Based on this, it cannot be proven that a faster adoption of digital channels leads to higher financial performance. Nevertheless, considering the small sample size in this research, there is a slight tendency to support the hypothesis at least partially. When looking at the separate channels on their own, the negative and positive coefficients indicate that the lack of a significant result might be due to different channels having a tendency of contradicting influences. These results are also supported by the discussed correlations, with Twitter and Facebook having positive but insignificant correlations with excess return and YouTube and Instagram negative and insignificant correlations.

Testing hypothesis 2. The second hypothesis proposes a positive influence of scope of digitization on financial performance, which the results fail to support (p= 0.399). Even though not significant, the influence of digitization scope on financial performance tends to be positive as indicated by the positive coefficient. Similarly, to hypothesis 1, this might be due to contradicting results for different channels. A higher activity on Facebook and Twitter might contribute to a higher financial performance, however with low coefficients and high p-values, a clear statement about single channels cannot be made. Especially the results for Facebook are vague, having a positive coefficient but negative correlation indicator with excess return.

Testing hypothesis 3. It was hypothesized that financial performance is positively influenced by digital strategy success. However, the results displayed in Table 6 indicate that this might be mistaken, as suggested by the negative coefficient. However, once again this result is not statistically significant (p=0.362). Interestingly, when looking at separate channels, YouTube is the only one with a positive coefficient on financial performance, suggesting that only a high amount of YouTube followers might contribute to a higher performance. However, when cross checking with correlations, even though not significant and only marginal, a negative

relationship between YouTube followers and excess return is suggested. In general, this is a counter-intuitive finding, since many companies build digital strategies having an increase in financial performance as a key objective.

Testing hypothesis 4. Lastly a positive relationship between a firm's digital orientation and its financial performance was suggested. Surprisingly the results reveal a tendency to reject this hypothesis, however, not significant on a 90% level. Additionally, digital orientation is the only indicator with negative coefficients for all separate channels as well, supporting the results in the original model. An explanation for a negative influence of digital orientation on financial performance in this study might be that investments in digital transformation are tremendous and positive effects might only be reached in the long-term. This study only considers a one-year time frame, that might not be sufficient.

Outer model. The outer model is a factor analysis of the different indicators on each formative construct as shown in Figure 3. To control for multicollinearity in the outer model, variance inflation factors (VIF scores) are computed, with multicollinearity not being an issue if VIF scores are below five. This is the case in all tests except for the main model using pairwise deletion of missing values, where Twitter and Facebook followers do have extreme values (VIF Facebook followers: 12.7; VIF Twitter followers: 18.5). As a next step, it is typical to control for the significance of outer weights and loadings, however in the pairwise deletion model these cannot be displayed due to a too small sample size for bootstrapping. Since VIF scores are below five in all other models, this is not given any further concern. However, it as to be noted that indicator weights and outer loadings are not significant in these models, which questions a theoretical importance of the indicators when assessing the formative constructs. This is further addressed in section 5.3.

Robustness checks. As a first robustness test, the model was tested with various methods of missing value replacement, to ensure that missing values do not influence the results drastically. Table 7 shows that there are only slight differences in coefficients and explained variance with

the different replacement methods. Also, p-values do not change sufficiently to change any significances. Secondly, each channel was tested separately to check for different effects. As displayed in Table 7, those models explain even less of the variance in financial performance. This is due to the fact of a very complicated dependent variable, since financial performance is influenced by a wide range of factors. In addition, values of a social media channel are very specific, and the underlying sample is rather small, resulting in non-significant effects. With most p-values higher than 0.5 in these single channel tests, any interpretation must be made carefully, keeping these issues in mind. However, as already described above, these tests indicate different effects of different channels. Lastly, it was controlled for firm size, measured by the number of employees and firm age. Results can be seen in Table 7 as well. There are no statistical significant effects of the controls, however it is notable that the explained variance is increasing, indicating that the variation in excess return might also be influenced by factors such as firm size and firm age.

All in all, the findings in this study may not be statistically significant, but certainly indicate interesting tendencies. The lack of significance as well as the low R^2 might be due to the complex dependent variable of financial performance, very specific independent variables as well as a small sample size and missing values.

5. Discussion

This study aimed to explain the relationship between the determinants of digitization and financial performance. Even though findings were not statistically significant on a 90%-level, two counter-intuitive tendencies were found. Firstly, a more digitally oriented company seems to be financially subordinate in Germany. Secondly, a company with a successful digital strategy, namely many followers on social media channels, seems to perform weaker financially. This indicates that the trend of adopting social media and its usage to increase performance might be overestimated. However, in this study two commonly theories tended to

be supported as well, that an increase in breadth and depth of social media can increase financial performance and that adoption speed is of high importance as well. However, different channels showed different results, underlining that a statement about social media's influence on performance in general might not be accurate, but rather it needs to be disentangled per channel, even though more channels might lead to greater financial success.

Within the next section the findings are set into the context of existing literature, giving new implications for theory. Next, implications for practitioners are addressed and lastly limitations of this study are discussed, leading to recommendations for future research.

5.1. Implications for theory

Little research has been done on the topic of digitization in general and financial performance. This study contributes to existing literature by conducting a multi-channel and multi-industry approach of explaining the influence of digitization on financial performance. It investigates companies that differ in age, size and industry all listed in one stock-index, making them comparable. Furthermore, other than most studies only concentrating on Facebook or Twitter, this study initially takes more digital channels into consideration, that are not researched exhaustively (Alalwan et al., 2017). It is the first to include a digital orientation rating, next to only social media measures, addressing the fact that digitization includes much more than only social media.

Already in 1997 the dynamic capabilities perspective identified the importance for companies to adapt quickly to revolutionizing market conditions (Teece et al., 1997), which is a theory supported by the findings of this study. The proposal that a faster adoption of digital practices results into superior financial performance might however not be true for all digital channels. The contradicting results in the robustness checks lead to the possibility that an early adoption of Instagram and YouTube might have even caused a weaker performance financially. This could be due to high investments in terms of financial and human resources into these channels

early on, while the platforms itself were not sufficiently popular and developed. Therefore, faster might not always be better, but the optimal timing for utilizing digital channels needs to be found. In line with the capability based view companies need to detect digital innovations that are not valuable and, if necessary, resign from non-beneficial platforms. As prior studies emphasized, this study supports that different companies might find different channels beneficial for their purposes (e.g. Schniederjans et al., 2013).

That is also shown in the contradicting influences of different channels within the scope variable, as seen in Table 7. Even though a higher adoption of social media channels tends to lead to superior performance in general, YouTube and Instagram seem to have a negative influence on performance. Therefore, the results of the underlying study partly contradict the findings of Paniagua and Sapena (2014) that financial performance is in general positively influenced by a greater adoption of social media. However, findings underline the statements of Du and Jiang (2015) as well as Schniederjans et al. (2013) that this influence differs by platform and might depend on the purpose of the content on the platform. However, as mentioned above none of the findings of the tested model were statistically significant, implying a limited impact of any interpretations. Like this study, Taken Smith et al. (2015) did not find a meaningful relationship between social media adoption and financial performance. They argue that this is due to the lack of social media quality measures or a time frame that was not sufficiently large. Answering to their call for future research, this study includes a quality measure, namely the amount of activity of the firms on each channel, and still does not find a meaningful relationship.

Culnan et al. (2010) state that the degree of success of a digital strategy is a key necessity of capturing value from digitization, with a fast adoption and high activity on different platforms not being sufficient. When taking a closer look at digitization success in the underlying results, it is surprising to see that it tends to have a negative influence on financial performance. Therefore, the results of this study agree with Culnan et al. (2010) that adoption and activity

alone do not lead to a meaningful impact on financial performance, however the positive influence of digital success cannot be supported. When addressing single channels, YouTube is the only one with a possible positive influence. This might be due to its different content of only videos, which do have a higher probability of reaching users emotionally than other forms of communication do. However, this is only a speculation so far and needs to be further investigated in future research. Notably here is also that YouTube subscribers have a meaningful positive correlation with EBIT, already on a 95%-level, supporting the bigger impact of YouTube on a company's financials. As a second social media success criterion, Twitter weakly positively correlates with EBIT, however this impact might be too small to cause actual beneficial influences in the underlying sample.

This study adds novel insights to existing literature, being the first to include a rating of firm's digital orientation and relating it to financial performance. Different than expected, results indicate a negative influence of digital orientation on financial performance. Noting that most firms already pursue a multi-channel strategy in terms of digitization, this might be explained by the high investments connected to the setup of those channels in terms of human and financial resources. In line with the explanation of Taken Smith et al. (2015) it is likely that a higher digital orientation only shows positive contributions to financial performance in the long-term and this study does not consider a sufficient time frame.

5.2. Implications for practitioners

Based on the results of this study many implications for practitioners should be considered.

Firstly, in line with the dynamic capabilities perspective, the results in this study recommend practitioners to be prepared for the rising trend of digitization. Many companies are already pursuing a multi-channel approach and firms who do not adopt any digital channels might miss out on potential benefits. Even though a fast adoption does not always necessarily lead to a superior financial performance, companies should build resources to be able to assess which digital channels might be beneficial for them.

Next, previous studies found that in the U.S. as well as the U.K. Facebook is the most dominant social network used by small and medium businesses (He et al., 2017; Michaelidou et al., 2011). When looking at the German companies listed in the mDax, YouTube and Twitter are used more than Facebook, showing that German companies might focus on different adoption channels. A reason might be that YouTube is the only channel that indicates a positive relationship of its subscribers with earnings. In general, effects of digitization scope and success are still unclear, but this study suggests that practitioners should carefully assess which channels are beneficial and which might even be harmful, since adopting more channels faster and getting many followers does not necessarily lead to an increased performance, but might even harm it.

When looking at some companies and their digitization strategies today, some interesting shifts can be detected that might support the findings of this study. P&G as well as Ferrero reduced their online marketing budget by 100 million dollars in 2017, claiming that this did not have any negative effects on their revenues (Bialek, 2017; Pfannenmüller, 2017). Both companies argue that online channel marketing did not reach promised results and therefore they decided to shift their focus back to traditional marketing efforts and channels such as TV and newspapers. Especially P&G is known as a digital first mover, putting a lot of resources into its digitization. Looking at this trend and the results in this study, it may imply that companies that are too digitally oriented might lose sight of beneficial traditional opportunities, such as offline marketing and might have overestimated the effects of digitization and online media usage. This is in line with studies claiming that a company has to execute an integrated ecosystem of different media types and that digital channels are not more beneficial than traditional ones (Hanna et al., 2011; Paniagua & Sapena, 2014). These indicators and the counter-intuitive findings of a possible negative influence of digital orientation on financial performance lead to the recommendation for practitioners to assess the benefits of the adoption and usage of digital channels exhaustively, comparing them to traditional opportunities.

Dependent on the industry and goals of a company, only several channels might support an increase in financial performance.

All in all, managers should be prepared to build digital capabilities and adapt to latest trends, but at the same time be sceptical and not overestimate the potential of digitization. Lastly, research on the topic is still at an infant stage and should therefore be monitored regularly to get new insights continuously. Especially the lack of meaningful results imply that social media variables might not be as big as an influencer of digitization and a digital presence might not be as beneficial for financial performance as many practitioners estimate.

5.3. Limitations and further research

The underlying study has several limitations that need to be addressed. Firstly, limitations concerning the sample and data collection and secondly limitations of the methodology and results, which lead to suggestions for future research.

The sample of 48 included companies listed in the mDax is relatively small and contains many different companies with a high variance and standard deviations in many indictors. This could be one reason for the lack in statistically significant results in the tests of the hypotheses. Next, it only includes companies from Germany, making it impossible to generalize the results on a global level. Therefore, it is called for a similar study pursuing a cross-country and cross-industry approach with a bigger sample size. Furthermore, financial data was collected over a time-frame of one year, since this research was conducted with a limited time frame. Additionally, *Uniper* and *Innogy* could not be included due to their young firm age. However, to detect long-term effects of digitization on financial performance a longitudinal panel data analysis is recommended for future research, including all companies listed in an index.

Relying on publicly available data of the companies themselves limits this research as it must assume the correctness of the companies reports, as well as trust external sources such as sociograph.io and twitonomy.com. Additionally, when collecting data on social media sites, one difficulty is to identify the right pages to include, since many companies do have different

pages within one platform, standing for different purposes like recruiting or marketing as well as distinct locations. This might have led to mistakes in the data collection of some measurement indicators. In general, the German pages with the most followers and activity were used, in case of more available pages. In case there was not a division by countries, the international page with the most followers was chosen. The number of different pages a company has within one channel was not included in the study, posing another limitation. However, this study was conducted with a limited time frame, not allowing for a too complicated setup. In future studies this should be taken into consideration. Addressing the rating of digital orientation, it needs to be noted that rating scores might be subjective, with a comparison only made between two independent conductors of the scoring process, with limited sources of information. A more objective, generalizable methodology for a similar rating needs to be found.

Moving on to the testing of the proposed hypothesis, it needs to be noted that neither factor weights nor loadings in the outer model were statistically significant, implying that the chosen measurements are only weak indicators for the formative constructs. Digitization speed, scope and success might be influenced by many more factors next to social media, which should be addressed more closely in the future. In fact, Veronica Schuh is conducting a similar master thesis now, researching the indicators of scope and speed of digitization, based on the same sample. Additionally, in the inner model the explained variance of financial performance by the dependent variables is weak, also indicating that there are many other existent influences on financial performance, which should be included in future studies, e.g. investment budget, innovativeness or reputation. Next, relationships between the chosen independent variables are not researched here, but should be investigated. Especially digital strategy success could arguably also be a mediator between digitization speed, scope, digital orientation and financial performance. Also, influences such as online marketing budget as well as the usage of traditional channels were not considered due to time limitations as well as limitations using the

Smart PLS program. The small sample size only allowed the inclusion of four variables as well as four indicators per independent variable. Additionally, the sample was insufficient to allow bootstrapping calculation using pairwise deletion of missing values, also due to too many missing values. The program could be used more effectively with a larger sample size.

All in all, researchers should conduct a longitudinal panel analysis, including data from more than 50 companies, to be able to include more indicators and formative constructs in the model. A bigger sample size would also allow it to include all digital channels in the testing of hypotheses. In line with the underlying study, companies from multiple industries and various social media channels should be included. However, this needs to be enriched by more variables next to social media, influencing digitization.

6. Conclusion

During the last decades, digitalization has grown in importance and interest. This study found no evidence of a significant association between digitization determinants and financial performance, not being able to answer the research questions with certainty. However, it can be concluded that every company should be aware of this trend and assess carefully if and how a digital presence can contribute to its performance. It has been shown that different channels can have oppositional effects, helping some companies to improve while harming others. Unquestionably, this study calls for further research on the influence of single sources of digitization on financial performance on a bigger scale.

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Statement of originality

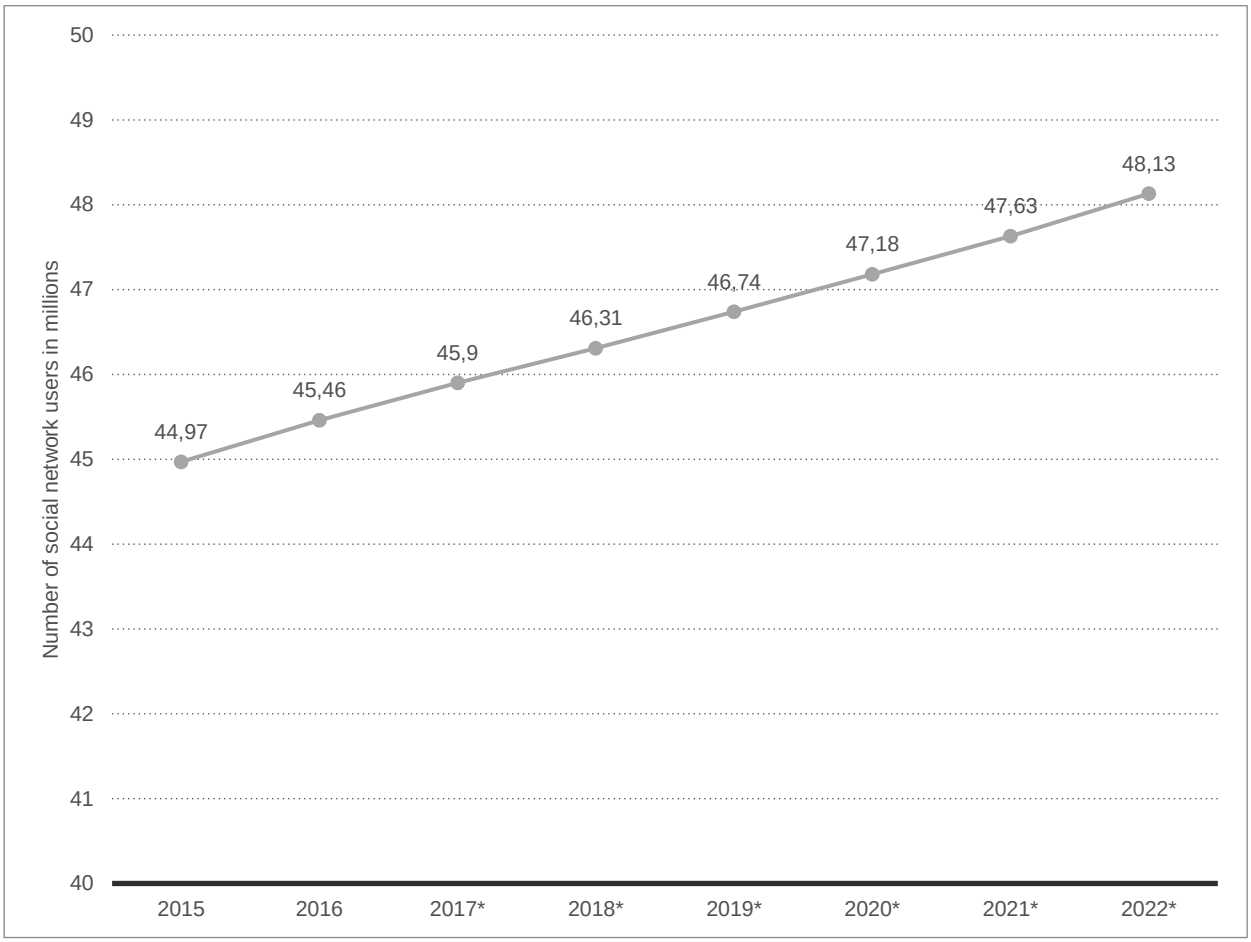
I certify that to the best of my knowledge, the content of this thesis is my own work, and I did not have assistance, except for the acknowledged support. All information and ideas from others have been referenced. I confirm that this study has not been published or handed in for any other degree than the two degrees mentioned on the title page at Maastricht and Nova university.

Laura Bunten, 03.01.2018

Appendix

Appendix 1

Figure 4: Forecast of social media user numbers in Germany from 2015 to 2022



Note: The figure shows user numbers of social media in Germany in the past and forecasts for the future. Data from Germany; gathered in July 2017. Individuals who use a social network via any device at least once per month. * forecast (Statista, n.d.).

Appendix 2

Table 7: Extract of the collected data on digitization

Company	Digital strategy	CDO/ responsible for digitization	digital orientation rating	FB usage	FB posts	FB followers	T usage	Tweets	T followers	YT usage	YT videos	YT subscribers	IN usage	IN posts	IN followers
Aareal Bank AG	0	0	3	1	3	76	1	187	481	1	16	7	1	0	2
Airbus Group SE	1	1	4	1	1429	1571481	1	9067	485964	1	683	212046	1	467	1000000
alstria office REIT-AG	0	0	1	0			1	2875	1817	1	25	13	0		
Aurubis AG	0	0	1	1	572	2228	1	618	453	1	24	85	1	115	214
Axel Springer SE	1	1	5	1	750	11461	1	484	2	1	151	689	1	660	1617
Bilfinger SE	0	1	2	1	319	5839	1	1170	3	1	85	850	1	0	211
Brenntag AG	0	0	2	1	108	1296	1	168	308	1	8	87	0		
Covestro AG	0	1	2	1	499	18918	1	8269	11600	1	164	390	0		
CTS EVENTIM AG & Co. KGaA	0	0	2	1	5049	52245	0			1	3	21	1	633	31200000
Deutsche EuroShop AG	0	0	3	1	749	240	1	3169	896	1	36	32	0		
Deutsche Pfandbriefbank AG	0	0	1	0			0			0			0		
Deutsche Wohnen AG	0	0	1	0			1	7	9	1	1	4	0		
Dürr AG	1	1	4	1	7	986	1	772	883	1	107	1183	0		
Evonik Industries AG	1	1	4	1	1615	28328	1	2227	6677	1	118	1852	1	12	174
Fielmann AG	0	1	1	0			0			1	57	1945	1	154	2988
Fraport AG	0	0	3	1	2174	341274	1	93100	40000	1	245	7222	1	668	87
Fuchs Petrolub SE	0	1	2	1	374	1433	1			0			0		
GEA Group AG	0	0	2	1	92	786	1	1750	2513	1	239	3412	0		
Gerresheimer AG	0	0	2	1	309	1155	1	144	450	1	48	138	0		
Hannover Rückversicherung AG	0	1	2	0			1	5	64	1	33	58	0		
HELLA KGaA Hueck & Co.	0	1	3	1	526	2795	1	0	3	1	109	3600	0		
Hochtief AG	0	0	3	1	0	291	1	5325	2381	1	21	91	0		
Hugo Boss AG	1	1	4	1	799	7747736	1	6775	671060	1	101		1	2284	2600000
Innogy	0	0	5	1	478	32952	1	1470	3502	1	95	1712	1	255	1188
Jungheinrich AG	0	0	4	1	1548	25984	1	4617	4736	1	256	2084	0		
K+S AG	0	1	2	0			1	0	83	1	58	434	0		

Company	Digital strategy	CDO/ responsible for digitization	digital orientation rating	FB usage	FB posts	FB followers	T usage	Tweets	T followers	YT usage	YT videos	YT subscribers	IN usage	IN posts	IN followers
Kion Group AG	0	0	2	0			1	1755	909	1	34	189	0		
Krones AG	0	1	3	1	1111	110583	1	15719	6369	1	1363	6898	1	1108	4599
Lanxess AG	0	0	2	1	361	25273	1	1671	6496	1	178	568	1	0	87
LEG Immobilien AG	0	1	2	0			0			1	22	74	0		
Leoni AG	1	1	2	1	587	12426	0			1	59	330	0		
Metro Group	0	1	3	1	1687	206791	1	931	1334	1	140	9673	0		
MTU Aero Engines AG	1	1	4	1	605	10300	1	2021	2017	1	96	886	0		
Norma Group SE	0	0	1	1	1200	25074	1	2051	1650	0			0		
OSRAM Licht AG	0	0	4	1	1331	66195	1	1686	2088	1	234	6059	1	114	1657
Rational AG	0	0	1	1	1952	176251	1	19817	8148	1	1198	5005	1	3676	9268
Rheinmetall AG	0	0	2	0			1	550	3260	1	71	9844	1	0	18
RTL Group SA	1	1	4	1	4548	999.088	1	5908	3938	1	15	50	1	224	83900
Salzgitter AG	0	0	2	0			1	2166	1886	1	61	690	1	42	317
Schaeffler AG	1	1	5	1	1355	69605	1	2412	13520	1	239	1106	1	0	399
STADA Arzneimittel AG	0	0	2	1	540	17774	1	709	1255	1	141	691	0		
Steinhoff International Holdings N.V.	0	0	2	1	20	570	0			1	9	0	0		
Ströer Media SE	1	1	4	1	894	3869	1	832	1356	1	37	161	1	0	34
Südzucker AG	0	1	1	1	564	10494	1	69	128	1	7	23	1	0	8
Symrise AG	0	0	2	1	8	76	1	291	1982	1	76	363	0		
TAG Immobilien AG	0	0	2	0			0			0			0		
Talanx AG	1	1	3	0			1	2524	1081	0			0		
Uniper	0	0	2	1	55	292	1	239	649	1	55	77	1	94	53
Wacker Chemie AG	0	1	2	0			1	2341	1985	1	129	1380	0		
Zalando SE	1	1	5	1	12296	4894347	1	11756	19465	1	478	49332	1	2359	420000
Total	12	24		37			43			45			23		
Average			2.60		1257	418335		5182	31271		162	7530		559	1535948

Note: The table shows an extract of the collected data of the companies in the sample. Data was collected from annual reports, the social media pages of the companies aa well as twitonomy.com and sociography.io. Bivariate variables are coded 0 for no and 1 for yes, missing values are marked grey. (Diginomy, 2017; Sociograph, 2017)

Appendix 3

Table 8: Example of excess return calculation of Zalando

Month	mDax (July 17-August 16)	mDax (July 16-August 15)	% difference	Zalando (July 17-August 16)	Zalando (July 16-August 15)	% difference	Excess return
July	24,554.80	21,164.40	16.02%	37.82	33.39	13.27%	-2.75%
June	24,452.30	19,843.40	23.23%	40.01	23.71	68.75%	45.52%
May	25,128.50	20,762.40	21.03%	42.51	26.35	61.33%	40.30%
April	24,615.80	20,100.70	22.46%	40.49	28.94	39.91%	17.45%
March	23,904.10	20,397.70	17.19%	37.93	28.85	31.47%	14.28%
February	23,365.50	19,422.00	20.30%	37.75	28.81	31.03%	10.73%
January	22,465.90	19,478.00	15.34%	36.51	31.67	15.28%	-0.06%
December	22,188.90	20,774.60	6.81%	36.29	36.4	-0.30%	-7.11%
November	20,876.50	21,593.40	-3.32%	35.17	32.1	9.56%	12.88%
October	21,146.20	21,174.50	-0.13%	39.99	31.86	25.52%	25.65%
September	21,584.00	19,279.70	11.95%	35.17	29.6	18.82%	6.87%
August	21,397.00	20,449.60	4.63%	34.28	29.2	17.40%	12.76%
AVERAGE			12.96%			**27.67%**	**14.71%**

Note: the table displays a calculation of Zalandos excess return. Returns between August 2015 and July 2017 were extracted from boerse.de. Calculation of percentage difference to the previous year of the mDax as well as the Zalando returns. Then the difference between the average % differences results in the excess return of Zalando (GmbH, 2017).

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